REMOVAL ASSESSMENT REPORT

FOR

WILCOX OIL COMPANY SUPERFUND SITE WEST 221ST STREET SOUTH/REFINERY ROAD BRISTOW, CREEK COUNTY, OKLAHOMA

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Prepared for

U.S. Environmental Protection Agency Region 6
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EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) tasked Weston Solutions, Inc. (WESTON®), the EPA Region 6 Superfund Technical Assessment and Response Team (START-3) contractor (EPA team), to conduct a removal assessment at the Wilcox Oil Company Superfund Site (Site) located near Bristow, Creek County, Oklahoma.

The EPA team conducted the removal assessment activities in two phases. Phase 1 was conducted 08 - 11 December 2014. During Phase 1, a total of 187 soil samples (including duplicate QA/QC samples) were collected for laboratory analysis. A total of 185 composite samples were collected from 57 grids and 2 locations and analyzed for lead by Method SW-846 6010. A total of 2 grab samples were collected from a potential waste pit identified in previous investigations. The grab samples were analyzed for Target Analyte List (TAL) metals by Method SW-846 6010, volatile organic compounds (VOCs) by Method SW-846 5035/8260, semi-volatile organic compounds (SVOCs) by Method SW-846 8270, and total petroleum hydrocarbons (TPH) by Method 1005.

Phase 2 was conducted from 18 May to 12 June 2015. During this phase, 240 soil samples (including duplicate QA/QC samples) were collected for analysis for TAL metals, including mercury, following EPA CLP Method ISM01.3, VOCs, SVOCs, and pesticides/aroclors target compound list by EPA CLP Method SOM01.2.

A review of sampling analytical results indicated that in Phase 1 lead, benzo(a)anthracene, and benzo(a)pyrene are present in soil above their respective EPA Removal Management Levels (RMLs). Phase 2 results indicated cadmium, cobalt, iron, manganese, and benzo(a)pyrene are present in soil above the EPA RMLs.

This report describes the technical scope of work completed as part of TDD No. 5/WESTON-042-15-004 under Contract No. EP-W-06-042 for EPA Region 6. The EPA On-scene Coordinator (OSC) was Mark Hayes, and the EPA Project Team Leader (PTL) was Derrick Cobb.

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☐ The EPA Task Monitor did not provide final approval of this report prior to the completion date of the work assignment. Therefore, Weston Solutions, Inc. has submitted this report absent the Task Monitor's approval.

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1. INTRODUCTION

Weston Solutions, Inc. (WESTON®), the Superfund Technical Assessment and Response Team (START-3) Contractor (EPA team), was tasked by the U.S. Environmental Protection Agency (EPA) Region 6 Prevention and Response Branch (PRB) under Contract Number EP-W-06-042, Technical Direction Document (TDD) No. 5/WESTON-042-15-004 (Appendix F) to conduct a removal assessment at the Wilcox Oil Company Superfund Site (Wilcox) located near Bristow, Creek County, Oklahoma. Site coordinates are Latitude 35.842144° North and Longitude 96.381456° West. A Site Location Map is provided as Figure 1-1. All figures are provided as separate portable document format (PDF) files. The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number assigned to the Site is OK0001010917.

This removal assessment report has been prepared to describe the technical scope of work and activities completed at the Wilcox Oil Site.

1.1 PROJECT OBJECTIVES

Technical assistance was provided to EPA Region 6 for performance of the Wilcox removal assessment to assist EPA in determining if the site presents a threat to public health or welfare of the United States or the environment in accordance with 40 *Code of Federal Regulations* (CFR) 300.415 as well as the nature and extent of such contamination.

The objective of the removal assessment was to investigate the nature and extent of site-related contaminants in the soil of residential properties built within the former refinery property boundaries or adjacent to the historical property boundaries associated with the Wilcox Site. To achieve this objective, EPA and the EPA team developed a field sampling plan that focused on sample collection in the immediate vicinity of the residential properties.

Phase 1 samples were analyzed for TAL metals, not including mercury, analyses by Method SW-846 6010, volatile organic compounds (VOCs) by Method SW846 5035/8260, total petroleum hydrocarbons (TPH) by Method 1005, and semi-volatile organic compound (SVOC) analyses by Method SW846 8270.

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Phase 2 samples were analyzed for Target Analyte List (TAL) metals, including mercury, following EPA CLP Method ISM01.3, volatile organic target compound (VOC) list, semi-volatile target compound list (SVOC), and pesticides/aroclors target compound list by EPA CLP Method SOM01.2.

1.2 SCOPE OF WORK

The removal assessment sampling efforts were focused primarily to determine the location and extent of site-related contaminated soil associated with historical operations. The scope of work included the following activities:

- Develop a site-specific Quality Assurance Sampling Plan (QASP).
- Develop a Health and Safety Plan (HASP).
- Obtain access to the subject properties.
- Collect soil samples from a predetermined grid system.
- Review analytical sample data results and compare those analytical results to the EPA Removal Management Levels (RMLs).
- Prepare a removal assessment report.

The site-specific QASP and addendum are included as Appendix A. The site-specific health and safety plan prepared for the project will remain as part of the overall project file until requested by the EPA OSC.

1.3 REPORT FORMAT

This removal assessment report has been organized as follows:

- Section 1 - Introduction
- Section 2 - Background
- Section 3 - Actions Taken
- Section 4 - Sample Analyses and Data Evaluation
- Section 5 - Summary of Analytical Results

Figures referred to in this document are presented as separate PDF files.

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2. BACKGROUND

Information regarding the site location and description, operational history, and a summary of previous investigations are included in this section.

2.1 SITE LOCATION AND DESCRIPTION

The Wilcox Site is located approximately 0.35 miles east of US Highway 66 on West 221st Street/Refinery Road, in Bristow, Creek County, Oklahoma. The site encompasses approximately150 acres, approximately 10 acres of which are being investigated as part of this removal assessment. The geographic coordinates of the site are Latitude 35.842144º North and Longitude -96.381456º West. A Site Area Map is provided as Figure 2-1.

The site is flanked by the Turner Turnpike's tollgate to the west, a residential area and the turnpike to the northwest and north, and a wooded area to the east and south. Site access is not controlled, although the residential properties on the site and the southern and eastern boundaries of the site are partially fenced with barbed wire. The remaining structures from the former refinery plant and tank farm include former refinery buildings, concrete pads, old tank foundations, and tank berms.

The topography in the vicinity of the site slopes to the south. Surface water runoff would follow the topography in the vicinity of the site. There are four fresh-water ponds on the site, and twohave been historically used for fishing. Intermittent streams drain the source areas and flow to the ponds and nearby Sand Creek to thesouth.

The site includes remnants of former oil refining operations and tank farms. The site has three major former operations areas: two processing areas with surrounding refined product storage and a crude oil storage area. An active railroad divides the two former processing areas and product storage areas. Most of the refinery structures and tanks have been removed or are in ruins. The tank farm covers approximately 80 acres and has a number of refinery waste source areas of concern, including a backfilled oily waste pond, a breached settling pond, a backfilled oily waste pit, a former pond apparently backfilled with solid refinery waste, and a number of tank bottoms.

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2.2 OPERATIONAL HISTORY

The site includes the inactive and abandoned Lorraine and Wilcox Oil Refineries. The property was utilized from 1915 to 1965 by two different refineries with overlapping boundaries. Wilcox Oil Company operated as a crude oil refinery from the 1920s until 1963. A skimming and cracking plant was constructed in 1929. The main components of the plant consisted of a skimming plant, cracking unit, and re-distillation battery with a vapor recovery system and treatment equipment. Wilcox expanded when it acquired the Lorraine Refinery in 1937, which was located adjacent to Wilcox. The two refineries comprised approximately 150 acres. The site includes remnants of former oil refining operations and tank farms.

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2.3 SUMMARY OF PREVIOUS INVESTIGATIONS

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Multiple sampling site investigations and sampling events have been conducted at the site. Preliminary Assessments (PAs), a Site Investigation (SI), and an Expanded Site Investigation (ESI) have been performed by the Oklahoma Department of Environmental Quality. In 2014, the EPA Emergency Rapid Response Services (ERRS) contractor capped and locked an abandoned drinking water well located near the former location of the First Assembly of God Church to the west of the site. ERRS also installed a fence with signage around an oily sludge pit located on a residential property developed within the historical refinery boundary (Property 001).

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3. ACTIONS TAKEN

The EPA team conducted removal assessment activities in two phases in general accordance with the EPA team's site-specific QASP and HASP prepared as part of the TDD requirements. Phase 1 was conducted 08 - 11 December 2014, and Phase 2 was conducted 18 May 2015 through 12 June 2015.

The field sampling strategy developed by EPA Region 6 and the EPA team focused on collecting soil samples from residential properties that have been built on or in close proximity to the former Wilcox Site. A Site Overview Map is included as Figure 3-1. Soil sampling, sample collection methods used, field quality assurance/quality control sampling, and investigation-derived waste management are described in the following text.

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EPA Guidance Documents and WESTON Standard Operating Procedures (SOPs), including sample collection techniques, were utilized during field assessment activities. Field logbook notes are included in Appendix B. Digital photographs of site-related activities are presented in Appendix C.

3.1 SOIL SAMPLING

Prior to initiating the sampling activities in Phase 1, EPA gained access to one targeted residential property (Property 001) within the former Wilcox Oil Site boundary. As part of the assessment activities, the EPA team collected 187 soil samples (including duplicate QA/QC samples) from a total of 57 grids. Grid locations were established using Global Positioning System (GPS) technology to obtain horizontal control of the sample locations. Two samples were also taken at the request of the EPA OSC of soil on the bank of an on-site pond and soil that was affected with a tar-like substance from an unknown source. Figure 3-2 presents the Sample Location Map for Phase 1.

In each grid, 5-point composite soil samples were collected utilizing a combination of hand-auger and/or direct-push technology. Dedicated acetate liners were used to reduce the possibility of cross-contamination between sample locations. Five separate pushes were conducted within each grid. Samples were collected from three discrete depth intervals: 0 to 3 inches bgs, 0 to 6

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inches bgs, and 6 to 12 inches bgs. Samples were composited per interval from the five aliquots within each grid and placed in dedicated plastic bags, homogenized, and transferred to clean, unused sample containers. Two grab samples were collected from a suspected waste pit located on the property.

Following sample collection, each sample container was labeled and placed in a shipping container (e.g., cooler) with ice while on-site. At the end of each day, each sample shipping container was repacked with ice and sufficient packing material (e.g., bubble wrap) to prevent movement of the cooler and breakage during shipment.

Prior to initiating Phase 2, EPA gained access to 9 residential properties. Phase 2 work was conducted in two sampling events due to heavy rain in the area. The first event was conducted 18 May to 22 May 2015, and the second sampling event was conducted 01 June to 04 June 2015. After completing the Phase 2 field work, a subset of samples was collected for metals analysis. The subset of samples was sieved to remove foreign objects from the samples. These samples were allowed to dry for 4 days prior to sieving due to the high-moisture content. The sieved samples were collected from 08 June to 12 June 2015. The EPA team collected a total of 240 soil samples (including duplicate QA/QC samples) from a total of 52 grids from 9 properties on and around the Wilcox Site (5 properties located on the site and 4 properties located adjacent to the site). Grid locations were established using Global Positioning System (GPS) technology to obtain horizontal control of the sample locations. At the direction of the EPA OSC, select locations were pushed to deeper depths to investigate the extent of potential historical contamination. The Sample Location Map for Phase 2 is present as Figure 3-3.

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In each grid, composite soil samples were collected utilizing a direct-push technology. Dedicated acetate liners were used to reduce the possibility of cross-contamination between sample locations. Five separate pushes were conducted within each grid. Samples were collected from four discrete depth intervals: 0 to 3 inches bgs, 0 to 6 inches bgs, 6 to 12 inches bgs, and 12 to 24 inches bgs. Samples were composited per interval from the five aliquots within each grid and placed in dedicated plastic bags, homogenized, and transferred to clean, unused sample containers. VOC samples were collected from one of the aliquots prior to compositing and homogenization to minimize volatilization loss caused by the homogenization.

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Following sample collection, each sample container was labeled and tagged according to the EPA CLP procedures and placed in a shipping container (e.g., cooler) with ice while on-site. At the end of each day, each sample shipping container was repacked with ice and sufficient packing material (e.g., bubble wrap) to prevent cooler movement and breakage during shipment.

The shipping containers for both phases were sealed and shipped via overnight delivery service to the participating EPA CLP laboratories. SCRIBE software was utilized to generate chain-of-custody forms, label information, and to manage and track sample information.

Prior to initiation of field work, the Oklahoma One-Call System was contacted, as well as local municipalities (e.g., power, phone, gas, cable, water, sewer, etc.) 48 hours prior to the sampling event to get underground utilities located.

3.2 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

The EPA team collected blind field duplicates and equipment rinsate and field blanks during the field activities as follows:

- A total of 15 blind field duplicate samples were collected during the Phase 1 soil sampling activity. During the Phase 2 activities, 21 blind field duplicate samples were collected. Duplicates were collected as splits of the normal samples. Analysis of the duplicates provides quality assurance of sampling procedures and laboratory analytical data by evaluating reproducibility of results.
- A total of 6 equipment rinsate samples were taken during Phase 2 sampling activities. This was accomplished by pouring laboratory-grade deionized water over decontaminated equipment (e.g., core barrels and or slab bar tube) and collecting the rinse water in appropriate sample containers. Equipment rinsate blanks were collected to provide information regarding the adequacy of the equipment decontamination procedures.
- A total of 5 field blank samples were taken during Phase 2 sampling activities. This was accomplished by pouring laboratory-grade deionized water in appropriate sample containers while standing on-site. Field blanks were collected to evaluate the potential contamination of a sample by contaminants from a source not associated with the sample.
- One trip blank sample was collected during the Phase 1 sampling activity. A total of 11 trip blank samples were collected during Phase 2 sampling activities. Trip blanks are pre-prepared by the laboratory by pouring laboratory-grade deionized water in appropriate sample containers. These samples are placed in coolers that contain VOC samples and are used to ensure that no cross contamination between samples occurred during transportation.

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Other quality assurance (QA) samples included temperature blanks placed in each cooler to evaluate the temperature of samples upon arrival at the participating EPA CLP laboratories.

3.3 INVESTIGATION-DERIVED WASTE MANAGEMENT

To reduce decontamination activities, dedicated sampling equipment was used whenever possible. This equipment and the other investigation-derived waste (IDW) produced during the field activities were managed on-site as part of the removal assessment activities. Acetate liners used during the sampling activities were placed in drum liners and disposed.

4. SAMPLE ANALYSES AND DATA EVALUATION

In Phase 1, Spectrum Analytical Inc. conducted sample analyses and data validation was performed by the EPA team. In Phase 2, sample analysis was conducted by both the EPA Region 6 Laboratory and the EPA-designated CLP Laboratory (ALS Environmental). The data review/data validation was performed by the EPA Region 6 Environmental Services Assistance Team (ESAT). These tasks were conducted in accordance with EPA CLP guidelines, WESTON's Quality Assurance Program, and the WESTON site-specific QASP.

As part of the overall removal assessment effort, a total of 427 soil samples (including duplicate QA/QC samples) were collected for laboratory analysis. A standard data management system that includes using bound field logbooks, site photographs, sample management and tracking procedures, document control, and inventory procedures for the laboratory data was utilized. SCRIBE software was utilized to create chain-of-custody forms and labels including managing and tracking sample information for samples submitted to the EPA CLP laboratories.

Information regarding laboratory analyses, data validation, and data reporting tasks are discussed in the following subsections.

4.1 LABORATORY ANALYSES, DATA VALIDATION, AND DATA REPORTING

The laboratories reported the analytical results in data packages meeting EPA CLP requirements. The laboratory documentation in these data packages includes records of instrument readings, calculations, calibrations, and quality assurance checks.

To meet the sample capacity requirements of the TDD for Phase 1, the EPA team shipped 187 soil samples (including duplicate QA/QC samples) to Spectrum Analytical, Inc., in Tampa, Florida. Phase 2 samples were divided between the Region 6 Laboratory in Houston, Texas and the EPA CLP-designated laboratory (ALS Laboratory in Salt Lake City, Utah) for analysis.

Appendix D includes the analytical data packages including data validation comments submitted by each CLP laboratory assigned to the project by EPA.

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4.2 DATA VALIDATION

The EPA Region 6 ESAT data review team conducted a review of the CLP data packages. Data validation was conducted in accordance with the EPA Contract Laboratory Program *National Functional Guidelines for Superfund Organic Methods* Data Review June 2008 and *Inorganic Superfund Data Review* January 2010.

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The data packages were reviewed to verify that they met the EPA technical requirements and Quality Assurance (QA) guidelines established for the respective analytical methods. The following list includes the items evaluated for each laboratory sample delivery group (as applicable):

- The chain-of-custody was reviewed to verify the sample IDs and the analyses requested.
- The sample receipt temperature was reviewed to verify that the cooler temperature was within acceptable range.
- Holding times were reviewed to verify the samples were extracted and analyzed within the required holding time.
- Laboratory blanks were reviewed to determine whether laboratory contamination was present.
- Matrix spike/matrix spike duplicate samples were reviewed to determine whether matrix interference was present and to determine if laboratory precision was within the acceptable range.
- Laboratory control samples and/or laboratory control sample duplicates were reviewed to verify the accuracy of the method.
- Surrogate recoveries were reviewed to verify that the recoveries were within the acceptable range.
- Initial calibrations were reviewed to confirm conformance to method acceptance criteria for percent recovery and/or correlation coefficient.
- Continuing calibrations were reviewed to confirm that calibration verification was performed before sample analysis and at the method-specified frequency. The calibration verification percent recoveries were reviewed and compared to acceptance criteria.
- Internal standards were reviewed to verify that the recoveries were within the acceptable range.
- Equipment rinsate blanks were reviewed to verify adequate field decontamination procedures.
- Field duplicates were reviewed to verify that field precision was within the acceptable range.

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- Reporting limits were reviewed to confirm that they were adjusted to reflect dilution factors and percent solids, if applicable.
- Sample results were reviewed to confirm that the detected concentration was within the instrument calibration range. If the concentration exceeded the instrument calibration range, the data was reviewed to determine if the sample was re-analyzed at a secondary dilution.
- Calculations were performed for sample results from each analytical package to confirm the final result reported by the laboratory. These calculations consider the result produced by the analytical instrument, sample volume, sample weight, calibration correlations, dilution factor, and percent solids, if applicable.

In summary, the ESAT data validation team indicated that the data are of acceptable overall quality for their intended use in meeting the objectives of the removal assessment.

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5. SUMMARY OF ANALYTICAL RESULTS

The EPA team conducted Phase 1 removal assessment activities from 08 December to 11 December 2014 in general accordance with the EPA team's site-specific QASP and HASP prepared as part of the TDD requirements. A total of 187 soil samples (including duplicate QA/QC samples) were collected and submitted for analyses. The samples were analyzed for TAL metals (not including mercury), VOCs, SVOCs, and TPH. Phase 2 removal assessment activities were conducted in two sampling events that took place from 18 May to 12 June 2015 in general accordance with the EPA team's site-specific QASP and HASP prepared as part of the TDD requirements. A total of 240 samples (including duplicate QA/QC samples) were submitted to EPA-designated CLP laboratories for analyses for TAL metals, including mercury, VOCs, SVOCs, and pesticides/aroclors. The laboratory data results were subsequently validated by the EPA ESAT team. Analytical results were compared to EPA Removal Management Levels (RMLs). Soil sample analytical exceedance summary tables are included as Appendix E.

A review of the sample results for Phase 1 presented in Tables 1 and 2 of Appendix E indicates that Lead located in soils of Grid 050 exceed the EPA RML of 400 milligrams per kilogram (mg/kg) in 6-inch (906 mg/kg) and 12-inch (5,850 mg/kg) depth samples. The Pit-02 sample indicates benzo(a)anthracene (18.4 mg/kg) and benzo(a)pyrene (11 mg/kg) in the soil above the respective RMLs of 15 mg/kg and 1.5 mg/kg. A map illustrating these results is presented as Figure 5-1.

A review of the sample results for Phase 2 indicates that Property 008 had soil exceedances in Grid 001 and Grid 004. Grid 001 exceeded the 70 mg/kg RML for cadmium with a result of 80.2 mg/kg in the 0-3-inch sample. Grid 004 exceeded the 1.5 mg/kg RML for benzo(a)pyrene in soil from the 0-3-inch, 6-12-inch, and 12-24-inch samples with results of 1.5 mg/kg, 1.9 mg/kg, and 1.7 mg/kg respectively. Property 019 Grid 002 exceeded the 55,000 mg/kg RML for Iron in the 0-3-inch sample with a result of 72,700 mg/kg. The manganese RML (1,800 mg/kg) was exceeded in the soil from Property 021, Grid 003, 12-24-inch sample with a result of 1,880 mg/kg. Grid 005 from Property 021 also exceeded the Cobalt RML (23 mg/kg) in the 0-6-inch sample (61.2 mg/kg). Phase 2 sample results are presented in Table 3 of Appendix E. Maps

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illustrating the results, including visual observations of deeper pushes within the evaluation areas, are presented as Figure 5-2 through Figure 5-10.

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